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METALLURGICAL INDUSTRY PLANS FUEL-SAVING MEASURES; SOME PLANTS REPORT ACHIEVEMENTS

/Numbers in parentheses refer to appended sources./

During 1948 and 1949, the majority of enterprises of the Ministry of the Metallurgical Industry achieved the prewar norms for optimum consumption of fuel and in many cases achieved the progressive norms. The increase in the technical level of production, improvement in the supplies of fuel, and the accomplishment of effective measures for fuel economy, including introduction of automatic control of operations in blast and open-hearth furnaces and soaking pits, resulted, in 1948 alone, in the following savings above the established fuel-consumption norms: Magnitogorsk Metallurgical Combine, 187,000 tons of fuel; Kuznetsk Metallurgical Combine, 77,000 tons; Zlatoust Metallurgical Plant imeni Stalin, 21,000 tons; Metallurgical Plant imeni Andreyev (Taganrog), 18,600 tons; Plant imeni Dzerzhinskiy, 16,200 tons; and Makeyevka Plant imeni Kirov, 10,000 tons. For all enterprises of the ministry, the 1948 savings fuel totaled more than 700,000 tons.

Automatic regulation of heating and technological processes led to sharp reductions in fuel consumptions in blast-furnace and open-hearth shops. The saving at the Magnitogorsk and Kuznetsk combines ranged from 10 to 13 percent in open-hearth shops. Automatization of soaking pits at the Moscow "Serp i molot" and "Elektrostal'" plants saved 10 percent on fuel.

Installation of flameless jets for burning blast-furnace gas under steam boilers is being continued with great success. Flameless jets were installed under 3 boilers in the Nizhnyaya Salda Plant in Sverdlovsk Oblast, under 6 at the Yenakiyevo Plant, Stalino Oblast, under 4 at the Satka Plant, Chelyabinsk Oblast, and under 4 at the Sinyachikha Plant, Sverdlovsk Oblast.

"Gosinspektsiya" (State Inspection) of "Gossnab" (State Committee of the Council of Ministers USSR for Material and Technical Supplies to the National Economy) USSR found in the first quarter 1949 that metallurgical enterprises

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have not instituted sufficient control on fuel consumption. At the Kuznetsk Combine, the temperature of the blast blown into blast furnaces has been reduced 50 degrees below the norm and from 80 to 100 degrees below the norm at the Plant imeni Kirov, with the result that these plants each waste more than 27,000 tons of coke each year. Failure to observe correct heating procedure in open-hearth furnaces at the Plant imeni Kirov has lengthened the melt by more than 30 minutes. Ingots brought to the stripping department from the open-hearth shop at a temperature of 1,200-1,300 degrees are allowed to over-cool, and are brought into the rolling shop at a temperature of 600-700 degrees, resulting in a loss of more than 18,000 tons of fuel per year. At the Magnitogorsk Metallurgical Combine and the Zlatoust Plant, ingots brought into soaking pits are allowed to cool to 700 degrees instead of the minimum of 800 degrees, resulting in fuel losses of 17,000 tons per year. Despite the automatic heating control which exists in the combine, heating of open-hearth furnaces is not uniform, with the result that in March 1949, three furnaces operated with a surplus of air, nine had insufficient air, and in 12 furnaces, coke gas was consumed at a rate 10-30 percent above the norm.

One of the chief factors having a direct bearing on the performance of open-hearth furnaces in the Zlatoust Plant is that the furnaces, built to operate on generator gas, are operating on mazut, with the result that the size of the existing mains and the capacity of the generators limit the heating capacity of the furnace and the entire heating regime is thrown out of balance.

The open-hearth shop of the Metallurgical Plant imeni Dzerzhinskiy has found the substitution of chromomagnesite for Dinas brick in the roof of one furnace very effective. This measure increases the length of the furnace run between repairs and the productivity of the furnace by 20-25 percent, and also reduces fuel consumption by 15 percent. In this plant alone, as much as 20,000 tons of fuel per year can be saved from this one measure.

Several plants continue to waste blast-furnace and coke gas. Waste of blast-furnace gas at the Plant imeni Voroshilov, Voroshilovgrad Oblast, amounts to 37 percent, at the Novo-Tul'skiy Plant, Tula Oblast, 35 percent; at the Plant imeni Dzerzhinskiy, 35 percent; at the Kuznetsk Combine, only 6 or 7 percent. At the Plant imeni Kirov, losses of high-calorific coke gas amount to more than 6 percent, as compared with the planned 1.5 percent. The gas tanks for holding surplus coke gas at this plant have not been restored, and much gas is also lost because of gas-main leaks.

The question of utilizing secondary power resources is given little consideration in metallurgical plants, with the result that a considerable volume of heat from waste gases and exhaust steam is not being used. The use of the heat of waste gases from open-hearth production is one of the chief and most effective methods of reducing fuel consumption in metallurgical enterprises. At the Kuznetsk Combine, however, construction of two waste-heat boilers, begun before the war, has not been completed. Waste-heat boilers, although available, have not been installed at the Magnitogorsk Combine, at the plants imeni Andreyev and imeni Kirov, and the Zlatoust Plant. Failure to utilize waste heat results in a loss of 50,000 tons of fuel for each of these plants. At the Plant imeni Andreyev, waste steam from steam hammers and other machinery, and also the steam from cooling waters is not being used. The Plant imeni Dzerzhinskiy is not using waste steam from hammers in the tire and forge shops, with result that more than 11,000 tons of fuel are lost annually from these causes alone.

Another major item in saving fuel is insulation of the open-hearth furnaces by which as much as 10 to 15 percent of fuel can be saved and productivity increased 10 percent. Despite these advantages, the work is going extremely slowly throughout the industry, and the waste of fuel from the lack of such insulation amounts to nearly 35,000 tons per year in the Magnitogorsk Combine and Zlatoust Plant.

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Heat and power installations in metallurgical enterprises are also responsible for much loss of fuel. The ministry has worked plans for improving the utilization of power resources within its enterprises. In 1949, it has been planned to introduce further automatization of boiler operations by automatic regulation of the water level in the boiler drum, automatic control of the temperature for superheating, and automatic regulation of combustion.

The ministry has also drawn up plans to introduce automatic regulation of the temperature of the blast and of Cowper jets in a number of blast furnaces, automatic reversal of valves in open-hearth shops, automatic control of the pressure in the working area, and regulation of the fuel and air ratio in open-hearth furnaces. Plans for this year also include testing and adjusting of Cowper stoves and establishment of optimum regimes for their operation in six metallurgical plants. Also planned is the installation of flameless jets in 25 boilers and four furnaces and wide-scale insulation of furnaces in 24 metallurgical plants. A schedule for utilization of exhaust steam has been drawn up for use in 14 plants. For 1949 - 1950, it has been planned to install 41 waste-gas heaters with a total heating surface of 45,000 square meters and 16 air preheaters with a total heating surface of more than 8,000 square meters, 54 waste-heat boilers and 91 regenerators. Large-scale mechanization of fuel charging and ash removal, construction of 16 water purifiers, and other measures for fuel savings will be introduced in 23 enterprises during 1949.

In connection with the adoption of progressive norms for fuel consumption at the Makeyevka Plant during 1948 - 1949, a number of measures were introduced which resulted in a considerable reduction in fuel consumption. These measures include utilization of the heat of the waste gases of soaking pits, introduction of flameless combustion of gas generating fuel, introduction of automatic regulation of furnace installations, and furnace insulation.

Each furnace in the thin-sheet mill was equipped with two regenerators for preheating the air, saving 25-27 percent on fuel. Besides fuel economy, preheating the air made possible the conversion of the furnaces from scarce gas coal to blast-furnace gas for heating. The productivity of the furnaces increased, formation of slag on billets decreased, and operating conditions improved.

Tests of using the regenerators in the furnaces of the sheet mill made possible the successful installation of regenerators in a number of continuous furnaces. Regenerators installed in furnaces in the light-structural mill operated for more than a year without repair and, together with insulation of the furnaces, accomplished at the same time, the optimum consumption of fuel decreased from 70 to 80 kilograms per ton to 40 or 50 kilograms per ton. On one continuous furnace, a regenerator was installed at the end of 1948 for preheating the air and the mixture of coke and blast-furnace gas. Simultaneous preheating of the gas and air helped to reduce the calorific value of the gas from 2,000-2,200 to 1,350-1,400 small calories per cubic meter and considerably reduced fuel consumption.

Flameless combustion of gas is being used successfully for improving fuel consumption and for utilizing the heat of waste products of combustion. The lack of high-pressure gas and the preheating of air in regenerators to 300-500 degrees excluded the possibility of using the usual flameless jets of the ejector type in soaking pits. In order to determine the effectiveness of flameless combustion of gas to obtain the necessary data for developing an effective design for a flameless low-pressure jet, two flameless jets were installed in a chamber furnace for operation on blast-furnace gas and preheated air. The results showed the advantages of flameless combustion of gas, and flameless jets were then put in the remaining chamber furnaces. A continuous furnace, operating on gas fuel, was also equipped with flameless jets. The jets have been designed to

operate on a mixed gas. As a result of lengthy experiments, a design was worked out for building jets for flameless combustion of mixed gas with calorific value of 1,500-2,000 small calories per cubic meter.

Tests made of the two types of jets (flame and flameless) have shown that the optimum consumption of fuel in furnaces equipped with flameless jets is 63 kilograms per ton, as compared with 95 kilograms per ton in furnaces with flame jets. Once the design for the flameless jet for combustion of low-pressure gas was found, it was used on a wide scale. These jets have been installed in the newly reconstructed continuous furnace where the jets operate on mixed gas and air heated in regenerators.

By the end of 1948, feeding of coke gas, blast-furnace gas, and air had been made automatic in open-hearth shops, and pressure control in the working area of the furnace had also been made automatic. In one furnace fuel consumption decreased from 0.206 tons per ton of steel in July 1947 to 0.150 in February 1948, after automatic control had been introduced. These excellent results led to the adoption of automatic control of the process of heating the soaking pits in rolling shops. At present, all three continuous furnaces are equipped with automatic control. Each furnace is equipped with regulators for the quantity of gas, air, and pressure under the roof of the puddling section of the furnace.

Furnace insulation has also had great effect. After being insulated, the operation of open-hearth furnaces improved, the average time for a melt decreased, and optimum fuel consumption decreased from 186-193 kilograms per ton of steel to 173-179 kilograms. For example, the length of the melt in Furnace No 1 prior to insulation was an average of 12.3 hours for April, 11.0 for May, and 11.5 for 10 days in June, while it averaged 10.9 hours for September and 10.2 hours for October after the furnace was insulated. These excellent results led the plant to insulate all open-hearth furnaces; this step reduced fuel consumption 6-8 percent. In the soaking pits, foam firebrick (penoshamotnyy kirpich) and diatomite brick were used as insulating materials for the walls and diatomaceous earth for the roof. Foam firebrick 65 millimeters thick was used for insulating the hearth of the open-hearth furnace, the rear wall, anterior wall, and roof; Dinas powder 20 millimeters thick for the roofs of the regenerators; tripoli earth 80 millimeters thick for the roofs of the slag pockets; and firebrick 330 millimeters thick for the walls of the regenerators and slag pockets.

Through 1948, the saving of fuel above the plan in the open-hearth, rolling, and power shops was equivalent to 8,850 tons of fuel. In 6 months of 1949, the saving of fuel for these same shops was 2,170 tons above plan. (1)

The "Krasnyy Oktyabr" Plant in Stalingrad has also introduced fuel-saving measures in addition to increasing mechanization and adopting new technology. Of particular importance is the introduction of instruments for automatic control of the heating system of open-hearth furnaces. The changes made in the structure of open-hearth furnaces as carried out in Shop No 2 have also helped considerably to increase the furnaces' productivity and to lengthen their service between repairs. Prior to these improvements, the furnaces had to be repaired after 70-80 melts, whereas now they are run for as many as 200-240 melts before being repaired. The change in the method of cooling the furnaces has cut water consumption 45-50 times. By using the steam which forms during furnace-cooling operations and by using the exhaust steam from steam machinery, the plant directors expect to heat all plant buildings and settlements.

Another important innovation has been the adoption of the hourly schedule of operations. Many rolling mills, operating on this schedule, have substantially increased productivity. The hourly schedule was of particular significance in coordinating the operations of the blooming mills with the open-hearth shops. In usual practice, the blooming mill cannot handle all the metal produced by the

open-hearth shops. Ingots often cool and then require a longer time and more fuel for reheating. Now the time used in delivering hot ingots into the blooming mill has been substantially reduced. The blooming mill has recently attained a productivity which exceeds that of the best prewar year. Productivity of the sheet-rolling, wire drawing, structural steel, light structural steel, and other shops has also increased markedly.

In preparing for 1950 goals, the plant proposes to introduce the automatic control system in all soaking pits and a number of pits will be equipped with certain special instruments with a view toward cutting fuel consumption 11 percent. New machinery will be introduced also in the blooming shop. The casting pit will be further mechanized. Slag removal will be completely mechanized. Lime-roasting furnaces will also be mechanized. At present, however, the plant is working at a disadvantage in that the Ministry of the Metallurgical Industry has not provided it with adequate supplies of ferroalloys and magnesite products.

As a result of the plant's improved technology and fuel-saving measures, it realized 35,300,000 rubles in profits in 10 months of 1949. Labor productivity in those months increased 23.8 percent for steel production and 20.9 percent for rolled metal production over 1948. (2)

SOURCES

1. Za Ekonomiyu Topliva, Vol VI No 9, Sep 49

2. Izvestiya, No 274, 25 Nov 49

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